

METHOD FOR COLLECTIVE DECISION-MAKINGBACKGROUND OF THE INVENTION

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Field of the Invention

The present invention relates to a method of collective decision-making using electronic communication media.

10 Description of the Related Art

There are computer-implemented programs currently available to support network conferencing, such as teleconferencing, videoconferencing and the like. These programs extend traditional conferencing capabilities from conference centers, where groups of individuals assemble in the same room, to the desktop computer where individuals can participate in conferences from their home or office. In addition, multi-user interaction can be advanced through collaboration management programs that enable data sharing across multiple hardware and software platforms.

20 For systems that permit sharing of data tied to application programs, it is generally required to share the application that supports the data. A problem that often occurs in these network systems is that individual users compete for access to application programs. Such competing interests interfere with data flow and as a result, preclude the use of more efficient methods that can only be exploited in a collaborative environment.

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A collaboration management system integrates real-time and asynchronous data flow, such that computers running one or more applications can be connected via a network, such as the Internet, or a local area network. An advantage of collaboration

management systems is that new application programs can be easily and inexpensively added to the system and that the collaboration can occur across different platforms.

5 Traditional trading activity has been based on individual bidding and buying. A trading network is characterized by computer modules that enable real-time communications between one or more computer networks supporting a plurality of users. Trading networks increasingly involve the use of one or more application programs for customizing user services, such as pricing updates and tax statements
10 customized for each client's portfolio. However, even though online trading networks have facilitated the buying and selling of stocks, the decision to buy a particular stock has largely remained an individual decision.

Therefore, what is needed is a method that allows a group of individuals or entities to
15 act as a single decision-making unit in determining whether to implement a course of action, such trading stock. It would be desirable if the decision-making process and implementation of the decision were integrated to simplify the overall task and assure that the collective decision is accurately implemented. It would also be desirable if the decision-making process following certain user-established criteria for arriving at
20 a decision.

SUMMARY OF THE INVENTION

The present invention provides a computer implemented method comprising
25 maintaining identification of a group of decision-making entities in a memory device and maintaining a setpoint representing a minimum cumulative support required to implement a proposed action in the memory device. A query is then communicated to the plurality of decision-making entities, wherein the query includes a description of the proposed action. Next, query responses are received from the plurality of

decision-making entities, wherein each response includes an indicator of support for the proposed action. Upon determining the cumulative support from the query responses received, the proposed action is automatically implementing if the cumulative support is greater than the setpoint. The indicator of support may be of a type selected from qualitative, quantitative, functional or a combination thereof. Optionally, the identification of each decision-making entity may include a weighting factor to be applied against the indication of support received from that decision-making entity in determining the cumulative support for the proposed action. Furthermore, the step of automatically implementing the decision may further include transmitting an instruction to one or more trading networks. Further still, the method may include receiving a request from one of the decision-making entities to initiate a query, wherein the request includes the proposed action.

Optionally, the method may include additional steps such as communicating messages to each of the plurality of decision-making entities, imposing arbitration among the plurality of decision-making entities if the query responses provide cumulative support less than the minimum setpoint, or initiating an intra-group caucus between a plurality of the decision-making entities. The communications may occur over a wireless network and/or utilize instant messaging. It is also noted that one or more of the plurality of decision-making entities may communicate through a personal digital assistant. Where the decision-making entities have different computer platforms or applications, the method involve a collaboration manage to interface therebetween.

In one embodiment, the method further includes communicating the cumulative support to the plurality of decision-making entities, formulating a second query based on this cumulative support, and receiving responses to the second query from the plurality of decision-making entities, wherein each of the second responses include a revised indication of support. Accordingly, the method then determines a revised cumulative support for the second query incorporating the revised indications of

support, and implements the proposed action if the revised cumulative support is greater than the minimum setpoint.

The invention also provides a computer program product including instructions embodied on a computer readable medium. The instructions comprise: maintaining instructions for maintaining identification of a group of decision-making entities in a memory device; maintaining instructions for maintaining a setpoint representing a minimum cumulative support required to implement a proposed action; communicating instructions for communicating a query to the plurality of decision-making entities, wherein the query includes a description of the proposed action; receiving instructions for receiving query responses from the plurality of decision-making entities, wherein each response includes an indicator of support for the proposed action; determining instructions for determining the cumulative support from the query responses received; and implementing instructions for automatically implementing the decision if the cumulative support is greater than the setpoint.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block flow diagram showing a system of the present invention supporting one or more decision-making forums.

FIG. 2 is a schematic diagram illustrating prior art computer architecture suitable for use in executing the present invention.

FIG. 3 is a schematic diagram illustrating an exemplary collaboration management system that facilitates development of application programs capable of sharing data, including data with arbitrary formats.

FIG. 4A and 4B show a flow diagram of a preferred method for implementing an decision-making forum to determine the cumulative support for a trading proposal.

FIG. 5 is a flow diagram of a method for building consensus within a forum by
5 invoking arbitration and caucussing sessions.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a method and computer program product for
10 promoting a collective decision from a plurality of decision-making entities that are in
electronic communication with a central forum coordinator that is responsible for
managing the decision-making process. The central forum coordinator, or a program
under the direction of the central forum coordinator, establishes a forum for each
proposed action or a group of related proposed actions and establishes a group of
15 decision-making entities that should be involved in the decision whether to implement
the proposed action or group of related proposed actions. The central forum
coordinator may cooperate with an instant messaging application to provide real-time
communication with and between the decision-making entities. The central forum
coordinator may also cooperate with a collaboration manager that allows cross-
20 platform and/or cross-application communication with or between the decision-
making entities.

The central forum coordinator is a computer-implemented process that queries a
plurality of decision-making entities to arrive at decisions that represent the collective
25 will of the group through a collaboration management system. If necessary, the
queries can be communicated through a collaboration manager that converts between
data having different formats. Thus, the use of a collaboration system opens new
markets for collaborative trading based on multi-user inputs.

The invention solves the efficiency problems inherent in existing decision-making processes by using a collaboration management system and an interactive decision-making method that calculates support for a proposal directly. Queries are used to invoke responses from a plurality of decision-making entities authorized to participate in a specific forum (i.e., the "forum participants"). The cumulative responses to these queries are used to calculate the cumulative support for a proposal and thereby, arrive at a collective decision. The interactive capabilities reduce the number of iterative steps, including the need for manual confirmation, that impede progress in asynchronous decision-making processes.

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A decision-making forum is a process in which queries and other communications between a central forum coordinator and a plurality of forum participants can be transmitted through a graphical user interface ("GUI") for display as a forum page or Internet Web page. A decision-making forum may utilize an instant messaging application in order to support real-time user interaction and further promote consensus-driven decisions.

The instant messaging application is administered by a central forum coordinator that is responsible for generating and carrying out instructions for progressing the forum. Specific functions of the central forum coordinator may involve inputting data, developing decision parameters and forum queries, monitoring communications and setting at least one setpoint value that can be used to determine when cumulative support for a decision has been reached. Preferably, the central forum coordinator resides as a software object on the server.

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A query must include a description of a proposed action and a decision parameter that dictates the manner in which an indication of support should be presented. For example, the decision parameters can be qualitative, quantitative or functional in nature or combinations thereof. By using a decision parameter, all responses will be

in a comparable form and allow the indications of support to be processed by the central forum coordinate in accordance with a predetermined formula, such as cumulative support or a weighted cumulative support. Other formulas, simple or complex, will be apparent to those in the art.

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The queries are then communicated to one or more decision-making entities that are capable of participating in an interactive forum and specifically authorized to participate in the specific forum. The decision-making entities respond using the specified decision parameter to indicate support for the proposed action. The central
10 forum coordinator determines if sufficient support for a proposition has been reached, i.e., the responses contain decision parameter values that, when processed by the predetermined formula, provide a collective value greater than a minimum setpoint value. If cumulative support for a decision is reached, then the decision is implemented. Preferably, the decision is automatically implemented through
15 electronic communication without requiring further human interaction.

In alternative embodiments, the central forum coordinator is vested with increasing authority. For example the central forum coordinator may be responsible for maintaining a list of potential decision-making entities. This listing can be used to
20 automatically select the decision-making entities that have registered interests that coincide with those of a particular forum. The central forum coordinator may be responsible for communicating responses and any additional support needed to reach the minimum setpoint value, to one or more of the decision-making entities. The central forum coordinator may also initiate queries that were generated or requested
25 by one or more of the decision-making entities, fashion further queries or adjust setpoint values as a means to reach cumulative support for a decision. The system format is sufficiently flexible to allow queries or minimum setpoint values to be formulated by one or more of the decision-making entities if they are so authorized.

Other more complex, consensus-driven mechanisms may also be initiated by the central coordinator, such as incorporating weighting factors for selected responses, imposing arbitration as a means to avert an impasse or establishing a communication link with a third party to gather further information. Weighting factors, authorization
5 levels and management vetos, or the like can be used to customize forum mechanics best suited to the interests and experience levels of the participants.

The central forum coordinator may have the authority to implement actions automatically based on the outcome of the decision. Alternatively, the central
10 coordinator may query the decision-making entities directly to obtain authorization to implement a decision. Optionally, the central coordinator may seek approval from one or more decision-making entities having veto-power prior to implementing a specific course of action. Finally, additional coordinators may be added to the system,
15 coordinator. In any event, the central forum coordinator initiates actions based on the cumulative support for a decision, for example communicating a trading instruction to a trading network.

Each forum is based on predetermined protocols, procedures or formulas as
20 established or setup by the parent organization which may be a corporation, a government entity or other institutional organization. A decision-making entity may be an individual, family, group, corporation, officer, employee, etc. that has registered an interest in participating in one or more forums (i.e., "the forum participants").

25 The central forum coordinator, preferably through use of the instant messaging application, uses database programs for storing and retrieving forum data, generating forum display templates, updating decision parameters and logging communications from forum participants. Other primary functions of the instant messaging application include registering decision-making entities as forum participants and then measuring

the cumulative support for a decision as communicated by the forum participants interacting in an instant messaging forum.

5 The instant messaging forum is a medium that supports real-time user interaction and promotes rapid consensus-driven decisions. The instant messaging forum is used for communicating forum queries and other information between the central forum coordinator and a plurality of forum participants. Alternatively, the forum data can be transmitted through a graphical user interface ("GUI") for display as a Web page. The server generates a GUI that is downloaded and displayed by the browser (agent) supporting each forum participant's computer.

15 The central forum coordinator administers and supports the instant messaging application by providing numerous supervisory functions including (1) developing decision parameters and forum queries, (2) monitoring communications between forum participants, (3) inputting initial forum data into the application support databases, (4) setting at least one minimum setpoint value for determining when cumulative support for a decision has been reached, (5) initiating instructions and performing various administrative tasks, and (6) initiating actions based on the cumulative decision. Additional coordinators either residing on the host server or communicating with the program through a workstation can be added to the system, each of which may carry on all or part of the responsibilities of the central forum coordinator. For example, separate coordinators could be used in different divisions of a corporation, with the central forum coordinator being responsible for communications between divisions.

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A collaboration manager is a program that receives electronic communications from hardware or software entities having different input formats and then converts this data to a primary format capable of being transmitting to a plurality of users communicating through a collaboration management system or network. The

interaction between applications and users may be accomplished through a specification such as XML. The users may include individual computers, application programs or other network communication devices. The collaboration manager is used as a framework to build and support computer applications capable of receiving
5 and transmitting electronic data from a plurality of users, some of which may communicate through the Internet. Alternatively, the electronic data can be communicated from an interactive trading network or other communications networks and then downloaded and displayed as a Web page.

A collaboration management system is a network that includes the collaboration
10 manager, the collaborating users and further hardware and software modules supporting the collaboration manager as discussed below. The collaboration management system is used to format data for transmitting to one or more databases supporting the instant messaging application and to download instant messaging forum pages for display to forum participants, regardless of their computer platform.

15 Cumulative support for a proposal is measured by comparing forum participants' responses or the associated state change of one of more of the decision parameters with one or more pre-established setpoint values. The cumulative decision is conditioned on the collective response having achieved a predetermined setpoint
20 value. This process can best be illustrated by a stock trading scenario. For example, a proposal for a specified stock purchase ("the proposed action") is communicated to all registered forum participants. The responses "for" and "against" the proposal (qualitative decision parameters) are tallied and recorded in an electronic database maintained by the instant messaging application. If the number of responses cast in
25 favor of the proposal meet or exceed the pre-established minimum setpoint value, then cumulative support for the proposed action has been reached and a collective decision is made. This decision may authorize the central forum coordinator to implement the proposed action, for example by transmitting a stock purchase order to a remote trading network.

A collaborative decision of this nature can be used for developing further forum queries or for implementing a specific course of action that may involve further communications with one or more remote trading networks. Preferably, the specific
5 action, for example authorizing the purchase of a proposed issue of stock, is implemented by the central forum coordinator.

Because the preferred method is executed by a computer program, the central forum coordinator or instant messaging application may further include consensus-building
10 mechanisms or other program modifications best suited for a specific forum of interest. For example, the intrinsic value held by select participants may be incorporated into the decision-making process by attaching criticality factors to select queries, applying weighting factors to select responses, imposing arbitration as a means to avert an impasse, initializing intra-group caucussing as a means to further
15 forum discussions, establishing non-forum communication links with a third parties to receive further information, or the like.

Optionally, the central forum coordinator may allow queries or setpoint values to be formulated by one or more decision-making entities which may also be forum participants. The central forum coordinator may be responsible for communicating
20 responses, and any additional support needed to reach the minimum setpoint value, to one or more of the decision-making entities. Alternatively, the central forum coordinator may forward queries generated by one or more of the decision-making entities, fashion further queries or adjust setpoint values as a means to reach a cumulative decision.

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In other embodiments, the central forum coordinator may be responsible for maintaining a list of potential decision-making entities having different authority levels and then selecting specific decision-making entities to participate in any given

forum through a registration program. Some decisions may be conditioned on management veto or approval from other decision-making entities prior to initiating action. Alternatively, the central coordinator may query the decision-making entities directly to obtain authorization to implement a decision.

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FIG. 1 is a block flow diagram showing the decision-making system of the present invention supporting one or more decision-making forums **210**. The present invention provides a method and a computer program product designed to invoke collective decisions involving a plurality of forum participants acting as a collective decision-making forum **210**. The decision-making system is shown including the instant messaging application **200**, a plurality of forum participants' computers (or other communication devices) **100**, at least one central forum coordinator **201**, a collaboration manager **10**, a server **15** and one or more remote trading networks **350**. Preferably, the instant messaging application **200**, central forum coordinator **201** and collaboration manager **10** reside on a common server **15** ("the server"). The server **15** may be a Web Application Server (WAS), a server application, a servlet process, or the like.

Each decision-making forum **210** is based on predetermined protocols as established by a parent organization consisting of a plurality of decision-making entities (members). A decision-making entity may be an individual, family, group, corporation, officer, employee, etc. that has registered an interest in participating an decision-making forum **210** (i.e., "the forum participants"). Preferably, each decision-making entity can participate in one or more decision-making forums **210** at the same time. In the preferred method, the subject matter of the decision-making forum **210** relates to stock trading. For example, a parent organization authorizes a forum to determine the collective support for a proposed stock transaction that is most readily performed by communicating with an interactive trading network **350**.

Forum participants located at online computers (or other communication devices) **100** communicate over a computer network **21** as a means to determine the collective support of the group through an decision-making forum **210**. The computer network **21** may be the Internet, an intranet, or other network. The instant messaging application **200** is programmed to communicate queries and forum data to registered forum participants' computers **100**. The server software includes further programs that enable the server **15** to download forum pages **220** for display to registered forum participants, thereby approximating real-time interaction on a trading network **350**.

10 A collaboration manager **10** is a computer program that converts communications having different data formats to a primary format that can be processed by the instant messaging application **200**. The collaboration manager **10** provides a framework for building and supporting applications capable of receiving and transmitting data between a plurality of forum participants, some of which communicate through the Internet. Specifically, the collaboration manager **10** enables communications between the instant messaging application **200** and forum participants' computers **100**, trading networks **350** or other communication devices. Preferably, the collaboration manager **10** receives all forum communications, but broadcasts communications only to forum participants which have registered an interest (and possess the requisite authorization level) in receiving information for a specific decision-making forum **210**.

One or more central forum coordinators **201** can be registered for communicating with the collaboration manager **10**. The central forum coordinator **201** is the software object that supervises the instant messaging application **200**. The functions of the central forum coordinator **201** include formulating queries, monitoring and controlling forum progress and implementing the collective decision if the decision criteria are met. The source data for initializing an decision-making forum **210** is input through the coordinator workstation **209** onto a forum template that generates the instructions that the instant messaging application **200** uses for maintaining the

support databases and calculating cumulative support for a decision. Additional coordinators either residing on the server **15** or communicating through the coordinator workstation **209**, can be added to the system, each of which may carry on all or part of the responsibilities of the central forum coordinator **201**. Alternatively,
5 all or part of the responsibilities of the central forum coordinator **201** may be performed by the collaboration manager **10**.

The collaboration manager **10**, the instant messaging application **200** and the central forum coordinator **201** are preferably implemented in the JAVA programming
10 language, which utilizes object-oriented program (“OOP”) techniques. As understood by those skilled in the art, OOP techniques involve the definition, creation, use and destruction of “objects.” Objects are software entities comprising data elements (i.e., “attributes”) and methods (i.e., functions or “rules”) that manipulate data elements that can be transmitted through object-streaming protocols.
15 These protocols are designed for reliable delivery and are secure on open networks such as the Internet **21**.

The instant messaging application **200** can accommodate numerous support databases as needed to implement a specific forum. Alternatively, all data relating to a specific
20 decision-making forum **210** may be contained in a single database or other central memory location. Preferably, the decision-making system will include at least one forum application database **204** containing data on specific forums, such as forum initiation and duration, addresses for registered forum participants and trading representatives, and instructions (master file) for generating forum pages. The forum
25 application database **204** may also contain further requirements for quorum voting, management vetoes or other forum restrictions.

The decision-making system may include a source member database **202** that contains records of each decision-making entity that has expressed an interest in participating

in one or more decision-making forums **210**. It is envisioned that the source member database **202** will contain master records for each decision-making entity and each trading company (broker) approved by the parent organization. The instant messaging application can use the source member database **202** to automatically generate a forum participants database **203**. The forum participants database **203** contains records for each member that has registered an interest in participating in a specific decision-making forum **210**. For example, the forum participants database **203** may contain information relating to the participants' voting privileges, computer passwords, authorization status and communication addresses for cell phones, pagers, and other communication devices.

Further support databases may include a decision criteria database **205**, a forum logging database **206**, and a forum page database **220**. In the preferred method, a decision criteria database **205** contains the decision parameters, setpoint values, forum queries, and the like. The forum logging database **206** can include pricing updates for each stock proposal, time and record of all forum communications and documentation of arbitration sessions. The forum page database **220** contains one or more forum pages generated through instructions (master file) contained in the forum application database **204**. Each forum page **210** can be uploaded by the server **15** for display on forum participants computers **100**.

Preferably, the server **15** generates a graphical user interface ("GUI") that is downloaded and displayed by the browser (agent) supporting each computer **100**. The GUI provides queries, messages and other forum data and allows forum participants to respond to queries or to initiate other actions (i.e., caucussing) directly. Optionally, forum participants can be identified and registered through instructions embedded on their computer **100** browsers and then hyperlink to a designated forum page for display through the network **21**. Some forum data may be restricted. Only forum participants having the requisite authorization level are able to access restricted data.

Proof of authority can include data such as a password or a combination of an online member identification and password assigned by a server **15**.

5 Additionally, the instant messaging application **200** can invoke consensus-building mechanisms, such as online arbitration or intra-group caucussing, that may further involve data sharing with application programs or non-forum entities. The server **15** preferably includes electronic mail software for processing e-mail messages and storing e-mail messages transmitted between the central forum coordinator **201** and forum participants, registered trading agents or other entities involved in a decision-making forum **210**.
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The instant messaging application **200** is preferably capable of accommodating a plurality of decision-making forums **210** simultaneously. In accordance with one embodiment, the illustration in FIG. **1** depicts two decision-making forums **210** (i.e.,
15 forum "A" and forum "B") in progress. For example, forum "A" can be progressed to invoke a decision whether or not to purchase stock through a trading network **350**. The instant messaging application **200** provides the method for calculating the cumulative support for the proposed stock purchase and determining if the cumulative support exceeds a minimum support level setpoint. A stock market trading program
20 **12** residing on the trading network **350** collaborates with the instant messaging application **200** to provide the name and value of the proposed stock.

The instant messaging application **200** stores the trading data and initializes the support databases needed to drive decision-making forum "A" **210**. The central
25 forum coordinator **201** uses this information to generate a bidding query that is downloaded to forum page "A" and communicated to the plurality of forum "A" participants. Forum "A" participants collaborate by responding to the query through the GUI displayed on their computers **100**. The instant messaging application **200** calculates the cumulative support for the proposed stock transaction based on the

responses received. Preferably, more than one decision-making forum **210** may be accessed by the same computer **100** at the same time. As illustrated, "Computer #2" and "Computer #4" are participating in both forum "A" and forum "B".

5 If the cumulative support does not meet the minimum support level, then one or more consensus-building mechanisms can be implemented. As illustrated, an arbitration session **301** is initiated automatically for all forum "A" participants and customized queries downloaded for display on forum page "A". Also depicted is an ongoing intra-group caucus **302** progressing between forum "A" participants collaborating on
10 "Computer #1" and "Computer #2" **100**. Note that the forum "A" participant collaborating on "Computer #4" is not authorized to receive these caucus communications. Each forum "A" participant may respond to the customized queries through the GUI displayed on their computer **100**. The process is repeated until a collective decision is reached or forum "A" is closed by a timer or other means. If
15 collaborative support in favor of the stock proposal is reached, the decision to purchase the stock is implemented automatically by the central forum coordinator **201**. The central forum coordinator **201** completes the transaction by communicating the order to the selected trading network **350**. A similar process is implemented independently for forum "B".

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FIG. 2 illustrates a prior art system architecture for a computer system **100**, such as an IBM THINKPAD 701® computer, on which the decision-making method can be implemented. The computer system represented in FIG. 2 is provided for descriptive purposes only, and should not be considered a limitation of the invention. Although
25 the description may refer to terms commonly used in describing particular computer systems, such as in IBM THINKPAD 701® computer, the description and concepts equally apply to other systems, including systems having architectures dissimilar to FIG. 2.

Computer system **100** includes a central processing unit (CPU) **105**, which may be implemented with a conventional microprocessor, a random access memory (RAM) **110** for temporary storage of information, and a read only memory (ROM) **115** for permanent storage of information. A memory controller **120** is provided for
5 controlling RAM **110**.

A bus **130** interconnects the components of computer system **100**. A bus controller **125** is provided for controlling bus **130**. An interrupt controller **135** is used for receiving and processing various interrupt signals from the system components.

10 Mass storage of data may be provided by diskette **142**, CD ROM **147**, or hard drive **152**. Data and software may be exchanged with computer system **100** via removable media **147** such as diskette or CD ROM. Removable media **147** is insertable into drive **146** that is, in turn, connected to bus **130** by a controller **145**. Hard disk **152** is
15 part of a fixed disk drive **151** that is connected to bus **130** by controller **150**.

User input to computer system **100** may be provided by a number of devices. For example, a keyboard **156** and mouse **157** may be connected to bus **130** by controller **155**. An optional audio transducer **196**, which may act as both a microphone and a
20 speaker, is connected to bus **130** by audio controller **197**, as illustrated. It will be obvious to those reasonably skilled in the art that other input devices, such as a pen and/or tabloid and a microphone for voice input, may be connected to computer **100** through bus **130** and an appropriate controller and software, as required. DMA controller **160** is provided for performing direct memory access to RAM **110**. A
25 visual display is generated by video controller **165** that controls video display **170**. Computer system **100** also includes a communications adaptor **190** that allows the system to be interconnected to a local area network (LAN) or a wide area network (WAN), or the Internet schematically illustrated by bus **191** and network **195**.

Operation of computer system **100** is generally controlled and coordinated by operating system software, such as the OS/2® operating system, available from International Business Machines Corporation, Boca Raton, Fla. or Windows 95® from Microsoft Corp., Redmond, Wash. The operating system controls allocation of system resources and performs tasks such as processing scheduling, memory management, networking, and I/O services, among other things. In particular, an operating system resident in system memory and running on CPU **105** coordinates the operation of the other elements of computer system **100**. The present invention may be implemented with any number of commercially available operating systems including OS/2®, UNIX®, Windows NT® and DOS, etc. One or more applications, such as Lotus Notes®, commercially available from Lotus Development Corp., Cambridge, Mass., may be executable under the direction of the operating system. If the operating system is a true multitasking operating system, such as OS/2®, multiple applications may execute simultaneously.

The present invention can be implemented on a variety of hardware platforms and can be implemented in a variety of software environments, perhaps using XML. A typical operating system may be used to control program execution within the data processing system. Furthermore, although the preferred method includes a "browser" as the agent which exchanges data in the security protocols with the Web Application Server, the agent at the online forum participants computers does not have to be a conventional browser, e.g., Netscape Navigator® or Microsoft Internet Explorer®. In order to secure the information transmitted to and from the server, the forum participant may be capable of Public Key Infrastructure (PKI) technology exchanged in a security protocol such as the Secure Sockets Layer (SSL) version 3.0 and above.

The present invention may be implemented in software that is stored as executable instructions on a computer readable medium on a forum participant's computer and the server system, such as mass storage devices or in memories. The server system

preferably includes a conventional server software program such as International Business Machines' Websphere®, for administering the content and interaction carried out for a specific forum.

5 FIG. 3 is a schematic diagram illustrating an exemplary collaboration management system or network. The network includes a server 15 on which a collaboration manager 10 resides. The collaboration manager 10 enables communication between various computers 100 or other communications devices having different formats. Each of the computers 100 may have one or more application programs 12 running at
10 the same time. Each of the application programs 12 are preferably stand-alone programs that can function independently, but can collaborate when operating with a collaboration manager 10.

The collaboration manager 10 includes at least one session object 18 and may include
15 a further coordinator module 26. A coordinator module 26 is a software program that maintains a record of all messages posted to a session object 18 and all communications transmitted from a session object 18 to the application programs 12. A session object 18 is a software object that processes all communications exchanged between application programs 12. A computer agent (i.e., browser) 28 requesting to
20 join a session registers an "interest" with the session object 18, where an "interest" is an attribute identifying the type of communications the application program 12 can receive. The session object 18 recognizes specific interests and enables data sharing between computers 100 having comparable registered interests.

25 The session object 18 includes an agent 29, a collaboration services interface 25 and a shared object 24. The collaboration agent 29 is responsible for locating a specific application program 12 and establishing a connection to it. The collaboration services interface 25 converts communications between programs having different input and output requirements. The shared object 24 can be created and maintained by the

server **15** as a part of the session object **18**. The shared object **24** posts messages to the session object **18**, receives messages from the session object **18**, and registers communication interests with the session object **18**. This treatment of shared objects enables application program functions to be executed on the server **15** and
5 consequently, reduces congestion across a collaborative network.

The collaboration manager **10** may communicate with the Internet representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. Online forum participants and remote servers may
10 be represented by a variety of computing devices, such as mainframes, personal computers, personal digital assistants (PDAs), smart phones, etc. The distributed data processing system may include additional servers, participants, routers and other devices not shown.

15 Of course, the collaboration manager **10** may also communicate with the computers **100** over a number of different types of networks, such as, for example, an intranet, a local area network (LAN), or a wide area network (WAN). It should be recognized that the network may include permanent connections, such as wire or fiber optic cables, or temporary connections made through telephone or wireless
20 communications.

Preferably, a graphic representation of the session object **18** is downloaded and displayed on each forum participant's computer **100**. Furthermore, the graphic display of the session object **18** enables the coordinator module **26** to determine
25 which forum participants computers **100** and other programs **12**, such as the instant messaging application, are utilizing the session object **18**. Each time a new member requests to join a session, the coordinator module **26** queries the session object **18** and confirms if the member is authorized to join the session.

FIG. 4A is a flow chart of a method for implementing an instant messaging application, executable on the system of FIG. 1, that determines when cumulative support for a trading proposal has been reached. In state **602**, one or more central forum coordinators, including at least one central forum coordinator that resides as a software object, are identified for the forum of interest. In state **604**, the central forum coordinator is registered with one or more trading networks as the representative carrying out transactions on behalf of the forum.

In state **606**, the instant messaging application initializes one or more databases supporting the forum of interest. Preferably, the following databases are established: (1) a forum participants database; (2) a forum application database; (3) a decision criteria database; (4) a forum logging database; and (5) a forum pages database. In addition, a source member database containing administrative information on all members of the parent organization is maintained for all forums. In state **608**, the forum participants' interests are registered through the session object located on the server.

It should be recognized that forum-specific data may be input to the system by a forum coordinator communicating through a coordinator workstation as part of various states, including but not limited to states **602**, **606**, **624** and **626**. Specifically, the workstation may allow an individual to provide the data necessary to build a master forum page, such as a query and a decision setpoint value.

In state **610**, each trading company approved by management to participate in the forum of interest is identified and, in state **612**, each company is registered with the session object located on the server. In state **614**, the data path to the trading network is confirmed by the collaboration manager. In state **616**, data, such as stock names, stock prices, trading representative addresses, and forum representative passwords are retrieved from the trading network server and downloaded into the corresponding

forum databases in state **620**. In state **622**, any authorization or security passwords required for accessing data within the trading network are recorded into the appropriate forum support databases. Hyperlinks to any interactive trading pages collaborating with the forum can be initialized in state **618** and routine
5 communication updates downloaded to the appropriate support databases in state **630**.

In state **624**, the electronic data stored in the various support databases is used to build one or more master forum pages. Forum page instructions can be interpreted by the browser (agent) for display on forum participants' computers. In state **626**, the forum
10 coordinators establish decision setpoints and formulate queries for communicating to forum participants. Optionally, the decision parameters and setpoint values can be adjusted as the forum progresses. The support databases are updated to include the setpoints and queries in state **630**.

15 In state **632**, the collaboration manager receives incoming forum responses and messages and verifies the address of the responder's computer browser (agent) in order to identify whether the responder is registered and duly authorized to participate in the ongoing forum. Alternatively, the central forum coordinator can query the collaboration manager to identify members utilizing the session object, for example
20 members requesting access to the forum through the Internet. Optionally, password protection can be imposed for the initial response. If in state **634**, it is determined that the responder is not properly authorized to participate in the forum, then the central forum coordinator may, in state **635**, determine whether to "enroll" the responder in the forum. If, in state **635**, the responder is not enrolled in the forum, then the
25 responder is notified of the lack of authorization in state **636**. If, in state **635**, the responder is in fact enrolled in the forum, then the responder's response is added to the forum page in state **638**.

If, going back to state **634**, it is determined that the responder is properly authorized, then in state **638**, the master forum page is updated to include the authorized response. Then, in states **672** through **682** (Refer to FIG. **4B**) this data is downloaded for interactive display to registered participants consistent with their authorization levels.

- 5 In addition, each authorized response is incorporated in the cumulative response calculations in state **640**.

In state **638**, any responses received are added to the master forum page database and in states **672** through **682** (Refer to FIG. **4B**) the data is downloaded to registered participants computers consistent with their authorization levels. For example, if so authorized, the central forum coordinator can link directly to the trading data relevant to the forum of interest, thus bypassing the home pages on the originating trading network or Web site. States **612** through **622** can be repeated for each trading company or communications network collaborating in the forum of interest.

- 15 Then referring to FIG. **4B**, the instant messaging application calculates the cumulative response for the query proposal and determines which participants have not yet responded by tally in state **640**. Then in state **642**, it is determined if sufficient responses have been received, for example the program verifies if the decision requires a minimum number of participants (quorum) or if select participant's responses are required (critical) for establishing a final decision. If there are not sufficient responses, then in state **644**, one or more requests alerting the non-responding participants to join the forum are communicated to the participant's email, pager, cell phone, and the like. Optionally, additional messages may be submitted on
- 20 a timed basis to some or all of the non-responding forum participants. If there are sufficient responses and the non-responding member is not critical for progressing the forum, then in state **646**, an "abstain" status is input into the forum participant's record and the server notifies the participant accordingly in state **648**.

In state **650**, consensus is determined by comparing the support received (cumulative response) in favor of the forum proposal with a minimum setpoint value devised to measure cumulative support of a decision. If in state **650**, the cumulative response does not meet the minimum setpoint value, then it is determined in state **652**, whether
5 the forum is closed. If the forum is not closed as determined by a timer or other pre-established conditions, then in state **654**, the instant messaging application may initiate one or more consensus-building sessions such as an arbitration or intra-group caucusing. The consensus-building sessions promote further interactive discussions that pass control back to state **626** for formulating additional queries or adjusting
10 setpoint values (Refer to FIG. 4A).

However, if the forum is closed then the central forum coordinator updates all support databases in state **656**, notifies the trading network representative (as applicable) in state **658**, and downloads the data for interactive display on the forum page according
15 to states **672** through **682**. In state **684**, a final message is delivered, and finally in state **686**, the forum is closed.

If, however, state **650** determines that the cumulative response meets or exceeds the minimum setpoint value, then the collective decision is input into the master forum page in state **660**. In state **670**, the central forum coordinator implements the decision and updates the master forum page to reflect the action taken. In the trading network example, this collaborative decision can be used to initiate a specific course of action that may involve further communications with remote trading networks as in state
20 **658**, for example authorizing the purchase of a proposed issue of stock through a trading representative. In states **672** through **682**, the data is downloaded for interactive display on the forum page, and in state **684**, the central forum coordinator delivers a closure message to all registered forum participants and finally in state **686**, the forum is closed.

Now referring to FIG. 4B, in states 672 through 682 the data is downloaded to registered participants' computers consistent with their authorization levels. Each forum participant that is authorized to receive communications for a specific forum can view forum data consistent with their authorization level. In state 672, if there are no restrictions for sharing forum data, then all forum participants have equal access to communications. In this event, the master forum page is updated to include the forum queries in state 674, and in state 676, the forum page is downloaded for display on the forum participants' computers. Security passwords can be used to gain access to the forum page. Alternatively, a Web page is generated and the forum participants can access forum data through the Internet.

However, if in state 672 some forum data is restricted, then the restricted data is communicated only to those forum participants having the proper authorization level. In state 678, each forum participant's authorization level is retrieved from the appropriate forum database and in state 680, only the data linked with the participant's authorization level is communicated. In state 682, the server downloads only the data that each forum participant is authorized to receive. Regardless, the display may be password protected to ensure that the restricted data is broadcast only to those participants properly authorized for its receipt. States 678 to 682 are repeated for each forum participant requesting access to restricted data on the forum page.

If in state 683, the forum is closed, then in state 684, the forum page is updated to reflect the closure status and a closure message is communicated to the forum participants. In state 686, the central forum coordinator closes the forum and takes the appropriate action based on cumulative support received at forum closure. If there is sufficient support to constitute a decision, for example if the cumulative support meets the minimum setpoint value, then this decision can authorize the central forum coordinator to automatically implement the proposed course of action, such as transmitting a stock purchase order to a remote trading network. If however, in state

683, the forum remains open, then the central forum coordinator awaits further forum communications and updates the forum page accordingly. If an arbitration or a caucus is in session then forum control returns to state 626 as discussed previously.

- 5 FIG. 5 is a flow diagram illustrating a method for building consensus within a forum. Consensus-building mechanisms, such as arbitration and caucusing discussed below, can be used to progress an ongoing decision-making forum. It is further noted that other consensus-building programs such as the use of weighting factors or a hierarchy of authorization levels can also be supported on the instant messaging application
10 framework.

- The proposed instant messaging application program describes a series of steps designed to increase the efficiency and effectiveness of real-time decision-making forums that focus on consensus-building techniques such as online arbitration and
15 intra-group caucussing for advancing forum discussions. In this respect, the collective decision is determined by responses to queries processed by the instant messaging application as logical decision parameters that each forum group can customize according to their own policies.

- 20 Consensus-building mechanisms offer distinct advantages in a forum setting. The goal is to expedite the collaborative decision-making process and thus, take advantage of opportunities as they arise on an interactive trading network. Group members benefit by having the ability to participate in refining and customizing decision parameters and setpoint values as the decision-making process progresses. The
25 customization process can be automated for transactions routinely performed by the same group of individuals, for example to anticipate the degree of risk, if any, savings plan members will collectively support when purchasing stock options. The arbitration is then structured to focus specifically on clarifying these issues in relation to the stock proposal.

An arbitration session is a method involving a series of iterative steps devised to move a group toward consensus. An arbitration session may be designated as either a "public" or "private" session. Preferably, in a decision-making forum, a "public" arbitration session is used to arrive at a decision that reflects the collective will of the forum participants. In a public arbitration all communications are made available to each member of the group. By contrast, a "private" arbitration is used whenever two or more forum participants desire to discuss confidential information, gather further information, communicate off the forum record or receive input from non-forum participants. Thus, a "private" arbitration can be useful for building consensus between upper level management or other participants having "different agendas" from the group as a whole. Comparable objectives can be met by establishing an intra-group caucus. The main difference between a "private" arbitration and an intra-group caucus, for the purposes of this discussion, is that arbitration imposes predetermined constraints, whereas the caucus promotes a free flow of information.

The method described below uses public arbitration as the primary means for invoking a sufficient level of support to collectively decide whether or not to invest in a given stock proposal. If it is determined in state **752** that the cumulative response for a proposal does not meet the setpoint value, but falls within a predetermined range **702** (tolerance) likely to lead to consensus, then in state **704**, the central forum coordinator communicates with the trading representative and requests negotiation. If the trading representative agrees to negotiate then an arbitration session is initiated and the forum participants notified in state **710**. If however, state **702** determines that the cumulative support does not fall within the specified arbitration range or if, in state **704**, the trading representative declines to negotiate, then the forum progresses without arbitration in state **706**.

In state **712**, a new proposal or further queries are communicated to the forum participants and in state **714**, consensus-building discussions progress under the supervision of the central forum coordinator. All communications are logged in the forum logging database and displayed on the forum page in state **716**. Preferably, an arbitration status screen, logging all authorized forum communications, is displayed on the forum page.

In state **720**, at least one forum participant may request to initiate a caucus, preferably by selecting the "caucus" button displayed on their graphical interface unit ("GUI"). This request is communicated to the collaboration manager that creates a private session object that identifies participants having comparable interests (or participants designated by the initiating caucus member) in state **722**. Each participant receives a "join caucus" message on their GUI and by responding to this message, establishes a communication link to the caucus in state **723**. If the initiating caucus member requests input from one or more non-forum entities in state **724**, then the session object similarly establishes a communication link with these entities in state **726**.

If in state **728**, the initiating caucus member requests in-house expertise, then in state **730**, the member sends queries to the central forum coordinator who forwards these queries on to individuals having the desired expertise as recorded in the source member database. It is envisioned that the individuals having the desired expertise respond to the queries through email communications. In state **732**, each caucus participant and any shared application programs send information to the session object by "posting" or sending a message to the session object and the caucus discussions are progressed in this manner. In state **734**, the caucussing forum participants can decide to share some or all of the caucus data with non-caucus forum members. Alternatively, the caucus data can be restricted such that only forum participants having the requisite authorization level can access caucus data. In any

event, the caucussing forum participants can continue to collaborate with the ongoing arbitration session in state **714**.

In state **740**, the forum participants decide when they have performed sufficient
5 discussions on the revised proposal. Preferably, each forum participant sends a
message to the central forum coordinator requesting that the proposal be submitted for
a vote. When sufficient requests have been logged then in state **742**, the central forum
coordinator formulates a new query and may also adjust the setpoint based on the
revised trading proposal and input received in the arbitration discussions. The new
10 query will reflect the revised trading proposal, but may include further conditions that
forum members have proposed in the arbitration session. Of course, any proposal
may be subject to management veto. If management approves the revised proposal
(and any conditions) in state **744**, or in the event the proposal is not subject to
management veto, then the central forum coordinator communicates the new query to
15 the forum participants, the forum participants respond to the query (or submit further
messages) in state **748** and the cumulative response is calculated in state **750**.

If in state **752**, the cumulative response still does not meet the setpoint, but falls
within the arbitration range in state **702**, the entire arbitration cycle is repeated until
20 state **770** determines that the forum is closed. Alternatively, if in state **740**, the revised
proposal is not submitted for a vote and the forum remains open in state **770**, then
new proposals or queries leading to further conditions may be developed by forum
participants in state **712** and the arbitration session continues. If however, the
proposal is vetoed by management in state **744**, or when the forum is closed as
25 determined by a timer or other pre-established requirements in state **770**, then the
action taken will be consistent with the latest cumulative response calculated in state
772.

If however, in state **752**, the cumulative response does meet the setpoint, then the revised proposal is approved and the central forum coordinator can take action and complete the transaction. In state **774**, the forum participants and the trading representatives are notified of the arbitration status at the close of the session and are

5 further notified of any action taken. Finally, in state **776** the consensus-building session is closed.